Todd Anderson General Poster.
Title Chlorophyll and Water Leaving Radiances from an Airborne Spectral Radiometer in Monterey Bay
Authors: Todd Anderson, NPS Steve Ramp, NPS
Abstract: Several flights over the Monterey Bay and surrounding coastal waters were conducted approximately every 2 weeks from early 2003 to early 2004 with an intensive sampling period (every few days) in August 2003. Hyperspectral data were collected at an altitude of ~30 meters above the sea surface with a HOBI Labs HydroRad measuring downwelling irradiance (Ed), upwelling radiance (Lu), and downwelling radiance Ld. The water-leaving radiance (Lw) was calculated and from this chlorophyll was calculated using the SeaWIFS OC4 version 4. The spectral results are compared to in-situ data from another moored HydroRad. The chlorophyll results are compared with SeaWIFS data on those days with good SeaWIFS coverage of Monterey Bay.

Antonio Baptista: OOS Poster
Title NANOOS Pilot Project: Observation and Prediction of the Estuaries and Shores of Oregon and Washington
Authors: Antonio Baptista, Oregon Health & Science University Jan Newton, University of Washington Jonathan Allan, Oregon Department of Geology and Mineral Industries Allan Devol, University of Washington Guy Gelfenbaum, United States Geological Survey Brian Grantham, Washington Department of Ecology Mick Haller, Oregon State UniversityGeorge Kaminsky, Washington Department of Ecology Parker MacCready, University of Washington Tuba Ozkan-Haller, Oregon state University Steve Rumrill, South Slough National Estuarine Research Reserve Yinglong Zhang, Oregon Health & Science University
Abstract: An observing system for the estuaries and shorelines of Oregon and Washington is being developed as a pilot project of the Integrated Ocean Observing System (IOOS) and as an integral part of the Northwest Association of Networked Ocean Observing Systems (NANOOS).

The project is anchored on five estuaries (Puget Sound, Grays Harbor, Willapa Bay, Columbia River and Coos Bay) and on shorelines in southern Washington and central/northern Oregon. Emerging standards and technologies have, however, wider applications. As an example, a novel fast-deployment forecast system for estuarine circulation is currently being applied (at various levels of maturity and robustness) to several estuaries in Oregon/Washington, one in northern California, and another in Florida.

This poster provides an update on the status of the project's (a) data, emerging technologies and standards, (b) their regional application and impact, and (c) their export in the context of NANOOS and IOOS.

Jim Bishop OOS Talk
Title: New Views of the Oceanic Carbon Cycle from Autonomous Explorers
Authors: Jim Bishop

Abstract: A new paradigm for ocean carbon observations is emerging with the rapid advances in autonomous measurements of carbon systems with the success of robotic ocean profiling Carbon Explorers, autonomous sensors for particulate organic and inorganic carbon (POC and PIC), and new instruments which will measure year-long high frequency records of POC and PIC sedimentation in the very observation-poor but biologically-active upper kilometers of the ocean. The new observing capability described here is critical for improved prediction of the substantial biotic carbon flows in the ocean. There are excellent prospects for an enhanced ocean carbon observing system fully capable of autonomous real time monitoring, measurement, and verification of ocean carbon sequestration.

Paul Bissett Remote Sensing.

Title: Imaging Spectroscopy in the Coastal Environment: Fun with Watercolors

Authors: Paul Bissett[1], Curt Davis[2], David Kohler[1], Curt Mobley[3], Robert Steward[1]

[1]Florida Environmental Research Institute

[2]Oregon State University, Cooperative Institute for Oceanographic Satellite Studies

[3]Sequoia Scientific, Inc.

Abstract: It is more difficult to use aircraft and satellite imagery to describe the environmental properties of the coastal ocean than to use such data for open ocean applications. These difficulties lie in two domains. The first domain is the time/space variability of the environmental signal. In this domain, the near shore physical forcing of the optical properties imparts a more complex time/space distribution of the color field. The second domain of difficulty lies in the complexity of the optical properties themselves. In the near shore environment, the water column color constituents are more diverse and co-vary less than in open ocean environments. This is in part a function of the enhanced variability in physical forcing; but it is also a function of the nearness of the benthic and terrestrial sources of nutrients and color. In addition to the enhanced complexity of the water column properties, the atmospheric properties are also more variable and complex in the near shore environment. The impact of atmospheric transmission on image quality increases as a function of the altitude of the sensor. At higher altitudes, the atmospheric contamination of the total image signal is far more difficult to quantify in turbid coastal environments compared to open ocean environments. These two sets of difficulties give rise to requirements for imaging spectroscopy in the coastal ocean that are far more stringent in its time/space/spectral resolution, as well as image quality, than are necessary for open ocean applications.

Yet, the difficulty in imaging spectroscopy is matched by the demand for information products. The coastal environment is the subject of great ecological and economic interest. The demand for frequent, robust information to help assess, manage, and protect the well-being of the coastal resources has accelerated in recent years, forcing the research community to focus on overcoming the imaging difficulties. This talk will describe the difficulties in coastal ocean spectroscopy, potential solutions to these difficulties, as well as some of the applications for these imaging products

Renato Castelao Remote Sensing

Title Sea-surface temperature fronts in the California Current System: Observations from geostationary satellite

Authors: authors: Renato M. Castelao(1), John A. Barth(1) and Timothy P. Mavor(2) (1) College of Oceanic and Atmospheric Sciences, Oregon State University (2) NOAA, National Environmental Satellite, Data and Information Service

Abstract: Four years of Geostationary Operational Environmental Satellites (GOES) data are used to study the seasonal evolution of sea-surface temperature (SST) fronts in the California Current System (CCS), focusing on the interactions with topographic perturbations. Maps of the probability of detecting a front (PDF) reveal significant temporal and spatial variability in the area. Winter is characterized by very low PDF along the entire coast. The PDF increases substantially during spring, especially to the south of Cape Blanco, Oregon, consistent with the wind stress seasonal cycle. The continuous input of energy from the wind to the system leads to intensification of the fronts, and maximum PDF is found during summer. Several studies have suggested that Cape Blanco is the northernmost location where the upwelling jet leaves the coast in the CCS. The SST frontal data confirms that the jet is deflected toward deeper waters at Cape Blanco, but suggests that late in the upwelling season (July-October) the upwelling front (and jet) leaves the shelf to the north of that, around Heceta Bank, Oregon. During fall, the PDF decreases considerably, but the offshore extent of the area of higher activity is maximum.

Dudley Chelton Remote Sensing

Title Summertime Influence of Sea-Surface Temperature on the Wind Stress Field Over the California Current

Abstract: Three years of satellite measurements of surface wind stress by the QuikSCAT scatterometer and sea-surface temperature (SST) by the Advanced Microwave Scanning Radiometer (AMSR) are analyzed to investigate the relationship between SST and wind stress on monthly time scales in the California Current region. The QuikSCAT data analyzed here have a resolution of 25 km and can measure the wind field to within about 35 km of land. The AMSR data have a resolution of 56 km and can measure SST to within about 75 km of land. In the region where QuikSCAT and AMSR measurements are both available beyond 75 km from the coast, the satellite data reveal that SST exerts a strong influence on the wind stress field during the summertime upwelling season from late May until late October. As has been observed elsewhere in open-ocean areas with strong SST fronts, the wind stress is higher over warm water than over cold water. The meandering SST front associated with the California Current thus generates complex structure in the wind stress field. This structure is manifest locally as a curl of the wind stress that is linearly related to the crosswind component of the SST gradient and a divergence of the wind stress that is linearly related to the downwind component of the SST gradient. This relationship breaks down in the vicinity of the expansion fan associated with Cape Mendocino. The SST influence on the wind stress field is weak between November and May.

James Churnside Remote Sensing

Title Airborne LIDAR Measurements

abstract: Starting with tests in 1997, NOAA has been developing an airborne LIDAR system for applications in marine fisheries management. The LIDAR uses a short pulse of green light in much the same way that an echo sounder uses a short pulse of sound to get scattering intensity as a function of depth in the water column. We typically fly at an altitude of 300 m and a speed between 60 and 90 m s-1. Penetration into the water column varies from 20 – 30 m in "green" water to over 50 m in "blue" water. Performance in "brown" water is generally not as good. While the LIDAR was primarily developed to survey small, schooling pelagic fishes, it also detects larger, individual fish, zooplankton, and water clarity. Internal waves have been observed through their effects on the scattering layer. Under some conditions, the level of dissolved organic carbon can be estimated. Other instruments are often flown on the same aircraft to obtain additional information. These include visible and thermal imagers for birds and marine mammals, a thermal radiometer for sea-surface temperature, and visible radiometers for ocean color.

Tim Cowles Mature Talk or Poster
Title Mesoscale biological and physical patterns in the Califiornia Current System as revealed by COAST and GLOBEC surveys
Authors: Tim Cowles, OSU Jack Barth, OSU Steve Pierce, OSU Christopher Wingard, OSU
Abstract: Three consecutive summers (2000, 2001, 2002) of mesoscale observations of physical and biiological parameters were obtained through SeaSoar surveys off the Oregon coast. The SeaSoar instrument suite included a CTD and bio-optical sensors, and a towed bio-acoustical system provided coincident assessment of zooplankton biomass. Shipboard ADCP revealed the velocity fields.

This unique dataset provides an interannual comparison of the biological response to physical forcing, as reflected in the cross-shelf and alongshore patterns of phytoplankton biomass, bio-optical characteristics of phytoplankton, and bio-acoustical estimates of zooplankton biomass. Of particular note is the spring to summer development of steep alongshore gradients in biological patterns of biomass distribution, coincident with the evolution of the coastal jet and its seasonal development around coastal topographic features.

The interannual comparison reveals consistent cross-shelf patterns of near-bottom particulate matter that had been resuspended from the sediment surface. The distribution patterns of fluorescent chromophoric dissolved organic matter (CDOM) also provide insight into the timing and intermittency of the advective and mixing processes operating just above the seafloor over the continental shelf.

Patrick Cummins General Poster
Title A regional index of NE Pacific variability based on satellite altimeter data
Co-Authors: Gary Lagerloef, Earth and Space Research Gary Mitchum, University of South Florida
Abstract: An index of climate variability to monitor the state of the upper ocean is proposed for the northeast (NE) Pacific Ocean based on sea surface height (SSH) data from satellite altimetry. While sea surface temperature (SST) is often used characterize

ocean variability, SSH reflects the integrated influence of temperature and salinity anomalies through the water column. A canonical correlation analysis shows that SSH and SST anomalies vary coherently at large spatial scales and low frequencies over the region. SSH anomalies are less subject to short period variability and the temporal components for SSH resemble smoothed, low-pass-filtered versions of the SST components. Also examined is the relationship between the SST-based Pacific Decadal Oscillation (PDO) index and the large-scale, upper ocean variability reflected in the leading principal component of SSH anomalies. The comparison demonstrates that the SSH principal component provides a robust index of regional c!
limate variability that is less noisy than the PDO. The results are used to examine the 1998-2002 climate event over the NE Pacific.

Curtiss Davis Remote Sensing
Title Monitoring the Coastal Ocean from Geostationary Orbit
Authors: Curtiss O. Davis and Mark Abbott College of Oceanic and Atmospheric Sciences, Oregon State University, Corvallis, OR 97331
Abstract: Coastal waters are highly dynamic. Tides, diurnal winds, river runoff, upwelling and storm winds drive currents from one to several knots. Hourly sampling from geostationary satellites can be used to resolve these features, and to track red tides, oil spills or other features of concern for coastal environmental management. To provide this capability NOAA is planning to include hyperspectral Coastal Waters imaging (HES-CW) as part of the Hyperspectral Environment Suite (HES) on the next generation Geostationary Operational Environmental Satellite (GOES-R) to be launched in 2012. The HES-CW will image the U.S. coastal waters once every three hours, with selected regions hourly. It will have 300 m spatial resolution and the high signal-to-noise ratio necessary for coastal imaging. To prepare for HES-CW NOAA has formed the Coastal Ocean Applications and Science Team (COAST). COAST goals are to assure that ocean applications and science requirements are met and to help NOAA prepare for the immediate use of the data when HES-CW is launched. This presentation describes the HES-CW requirements, current status and the activities of the COAST team to prepare for HES-CW.

Russ Davis Fireside Chat
Title The Past and Future of Profiling Floats and Gliders

Edward Dever Mature Talk or Poster
Title Surface Boundary Layer Variability off Northern California during Upwelling
Authors: Ed Dever OSU Clive Dorman SIO/SDSU John Largier UCD/BML
Abstract: A five element mooring array is used to study surface boundary layer transport over the northern California shelf from May to August 2001. In this region, upwelling favorable winds increase in strength offshore leading to a strong positive wind stress curl. We examine the cross-shelf variation in surface Ekman transport calculated from the wind stress and the actual surface boundary layer transport estimated from oceanic observations. The two quantities are highly correlated with a regression slope near one. Both the Ekman transport and surface boundary layer transport imply curl-driven

upwelling rates of about 3x10-4m s-1 between the 40 and 90 m isobaths (1.5 and 11.0 km from the coast respectively) and curl driven upwelling rates about 1.5x10-4m s-1 between the 90 and 130 m isobaths (11.0 and 28.4 km from the coast respectively). Thus curl-driven upwelling extends to at least 25 km from the coast. In contrast, upwelling driven by the adjustment to the coastal boundary condition occurs primarily inshore of the 40 m isobath. The upwelling rates implied by the differencing the 40 m transport observations with the coastal boundary condition are up to 8x10-4m s-1.

Clive Dorman Mature Talk or Poster
Title Wind Stress and Wind Stress Curl Over the N. California Shelf as Measured by Buoys and Simulated by Atmospheric Model during WEST.
Authors: C. Dorman, Scripps Institution of Oceanography,University of California San Diego Darko Koracin, Desert Research Institute, University of Nevada, Reno Ed Dever, College of Oceanic and Atmospheric Sciences, Oregon State University
Abstract: Many studies have confirmed that the effect of the along-shore wind stress on generating upwelling of coastal ocean waters is significant. The role of wind stress curl in driving coastal ocean processes, however, is not well understood. To investigate this, the WEST field program maintained an array of meteorological buoys for two years over the shelf off Bodega Bay, California to directly measure the winds, wind stress and curl of the wind stress. Four wind buoys were in diamond formation with the E-W and N-S buoys 10 km apart. At the center of the diamond was a 5th meteorological buoy. Wind stress curl is computed using the difference in the stress components between two buoys in the cross-shore and two buoys in the along-shore directions. Recent observations and mesoscale modeling results have emphasized that wind stress curl plays a significant role in forcing coastal ocean dynamics. Although the alternating periods of upwelling and relaxation are generally 8-10 days long, a much shorter variability—on the order of a day or so—is superimposed on the SST trend. The analysis of the field program over the shelf off Bodega Bay shows a much greater impact of wind stress curl than along-shore wind stress on SST. This study using observations and modeling also will reveal timescales of the oceanic response to forcing by wind stress and wind stress curl.

Dave Foley Remote Sensing
Title Satellite Data Distribution in the IOOS era
Author: Dave Foley University of Hawaii/JIMAR Southwest Fisheries Science Center, Environmental Research Division
Abstract: Researchers interested in satellite-based oceanic measurements are often confronted by a bewildering array of data products and formats. With the continuing increase in diversity, frequency, and resolution of spacebourne measurements, this problem is likely to get worse before it gets better. The Environmental Research Division of the Southwest Fisheries Science Center, and the West Coast Regional Node of the NOAA CoastWatch Program are working together to mitigate some of the confusion through the development of delivery mechanisms which allow seamless access to satellite data and derived products of many types. Additionally, we seek to provide smooth transitions between near real time data and the delayed science quality data sets more appropriate for many research applications. This process is likely to be a very dynamic one; interested data users are invited to participate at a number of levels ranging

from constructive criticism to the formation of partnerships which target the development of specific regional products.

Michael Freilich Remote Sensing
Title Microwave Remote Sensing of Ocean Surface Wind Speed and Direction: Accomplishments, Challenges, and Predictions
Author: M.H. Freilich College of Oceanic and Atmospheric Sciences Oregon State University Corvallis, OR 97331-5503
Abstract: Satellite-borne microwave scatterometers on NASA and ESA research missions have been acquiring near-all-weather vector wind measurements since the early 1990s. Open-ocean scatterometer data have been extensively characterized, and the measurements have been widely used in numerical and subjective operational forecasting, as well as in scientific research. The NASA QuikSCAT mission was recently extended through 2007. Beginning in early 2007, ESA/EUMETSAT will fly a dual-swath scatterometer on the operational METOP satellites. The U.S. NPOESS operational program will acquire surface wind measurements using microwave polarimetric radiometry, starting no earlier than 2010; the Windsat proof-of-concept mission was launched in early 2003, and preliminary vector wind data have recently become available for validation and analysis.

This talk will briefly review the bases of scatterometric and radiometric vector wind measurements, and summarize the quantitative accuracies of QuikSCAT and Windsat in both clear-sky and raining conditions. Examples of recent progress in the calculation of vector wind information with O(10 km) and higher resolution from QuikSCAT, especially in coastal areas, will be presented. Prognoses and challenges associated with planned and proposed future instruments on METOP and NPOESS, as well as issues related to the use of measurements with differing resolution, coverage, accuracy, and sampling characteristics will be outlined.

Albert Hermann Mature Talk or Poster
Title A comparison of remote versus local influences on the coastal circulation of the Northeast Pacific
Authors: Albert J. Hermann 1, Enrique N. Curchitser 2, Dale B. Haidvogel 3 and Elizabeth L. Dobbins 1
1 Joint Institute for the Study of the Atmosphere and Ocean, University of Washington, P.O. Box 357941, Seattle, WA 98195, U.S.A.
E-mail: Albert.J.Hermann@noaa.gov
2 Lamont-Doherty Earth Observatory of Columbia University, P.O. Box 1000, 61 Route 9W, Palisades, N.Y. 10964-8000, U.S.A.
3 Institute of Marine and Coastal Sciences, Rutgers University, 71 Dudley Rd., New Brunswick, N.J. 08901-8521, U.S.A.
Abstract: A major goal of Northeast Pacific GLOBEC program has been to elucidate the magnitude and mechanisms of physical and biological covariance between the California and Alaska coastlines. In one such exploration, a set of nested circulation models has been used to explore the remote and local influence of the 1997-1998 El Nino on the circulation and temperature fields of the Northeast Pacific. Our nested set includes a

basin-scale model of the North Pacific at ~40 km resolution (NPac), and a regional model of the Northeast Pacific at ~10 km resolution (NEP). The NEP model spans an area from Baja California through the Bering Sea, from the coast to ~2000 km offshore. In this context, “remote influence” refers to effects driven by changes in ocean velocity and temperature outside of the NEP domain; “local influence” refers to direct forcing by winds and runoff within the NEP domain. We have performed a series of sensitivity runs with the NEP model, which analyze the effects of: 1) hindcast winds (from NCEP reanalysis) and coastal runoff, as compared to monthly climatologies; and 2) hindcast boundary conditions (from the NPac model), as compared to monthly climatologies. Results indicate penetration of SSH and associated upwelling/downwelling anomalies from the basin-scale model into the NEP domain (e.g. “remote influence”), with propagation as Coastal Trapped Waves from Baja up through British Columbia. Most of the SSH anomaly off Alaska in El Nino years appears due to direct forcing by winds (“local influence”). We quantify such effects, including the penetration of anomalous temperatures through the southern boundary of the NEP domain, and suggest how they might impact patterns of primary production. Previous GLOBEC investigations with the NEP model explored the spatial structure of locally forced SSH and SST using EOF analysis. Here, this analysis is extended to: 1) compare the EOFs of surface properties, under local vs remote forcing, with satellite-based and in situ observations; 2) explore the EOFs of subsurface properties, and their response to local vs remote forcing; and thereby 3) explore to what extent covariances between the California and Alaska regions are locally vs remotely driven.

Maria Jose Juan Jorda **General Poster**

Title Integration of Oceanographic Information off the Oregon and Washington Coasts into Fisheries Management: Can we define “Ocean Fish Habitats”?

Authors: Maria Jose Juan Jorda and John A. Barth,College of Oceanic and Atmospheric Science, Oregon State University

Abstract: This work is an attempt to incorporate oceanographic information into fisheries management. To date, the use of oceanographic data in fisheries management has been minimal due to scarcity and the difficulty of accessing complete oceanographic datasets. Consequently, fish stocks are managed with limited knowledge about the habitat where fish live and incomplete understanding of what oceanographic conditions affect their populations. This inadequate scientific knowledge among other factors has lead to the management failure of the West Coast groundfish fishery. With the long term goal to improve the management of the groundfish fishery, this study assembles and merges oceanographic information off the Oregon and Washington coasts to investigate if there are particular ocean habitats associated with four different groundfish species with different life history. The fish data consist of NOAA NWFSC’s West Coast Groundfish 2004 Survey and the oceanographic data are comprised of temperature, salinity, chlorophyll concentration, and ocean current velocity from a variety of sources (satellite sensors, conductivity-temperature-depth instruments, acoustic Doppler current profilers and high frequency radars located on the coast) from the earliest time possible to the year 2004. Climotological monthly means and standard deviations for each of the oceanographic variables have been computed at various depths for the cold regimes (1946-1977, 2000-2004). The oceanographic and fish data are being organized in a GIS

system, so that it may be combined with benthic habitat information. Work is in progress to carry out a statistical analysis between the oceanographic and fish data.

David Kaplan Mature Talk or Poster
Title The role of HF radar data in the WEST project
Authors: David M. Kaplan, UC Davis John L. Largier, Bodega Marine Lab, UC Davis Louis W. Botsford, UC Davis
Abstract: HF radar data is greatly expanding our knowledge of surface flow patterns in the area around Pt Reyes Peninsula, California. Here I will summarize results from three years (20012003) of near continuous surface current measurements in the area, with an emphasis on making connections with other biological and physical measurements taken during the project. Surface flow patterns reveal a strong bimodality in flow, with equatorward flow dominating during periods of upwelling favorable winds, particularly over the shelf edge, and considerable poleward flow occurring over the inner and midshelf during relaxation. Surface divergence patterns indicate significant upwelling of subsurface waters north of Bodega Head during periods of equatorward winds, consistent with the local wind maximum and higher seasurface temperatures south of Bodega Head. Positive divergence is also observed during relaxation periods when flow separates from the shore north of Pt Reyes. These patterns of flow and surface divergence suggest that the accumulation of upwelled waters south of Pt Reyes which are later transported northward and enriched by localized upwelling during relaxation events might be important for coastal productivity in the area.

Julie Keister Extreme Event
Title Unusually warm ocean Conditions and a collapsed food chain observed during summer of 2005 from N. California to British Columbia
Authors: Julie Keister (Oregon State University) William T. Peterson (NOAA Fisheries - NW Center)
Abstract: During the spring and summer of 2005, conditions in much of the California Current north of approximately 37 N have resembled a major El Niño event yet no such event was recorded at the equator. The coastal ocean temperatures have been anomalously warm in 2005 with +4 deg C anomalies at the NOAA:Stonewall Bank buoy and + 6 deg C anomalies at nearshore hydrographic stations off Newport, Oregon. Some yet-to-be-discovered atmospheric or physical oceanic event has led to a persistence of winter (and El Nino)-like conditions through the spring and into calendar summer. These unusual and anomalous conditions have led to changes in the normal seasonal cycle of production and persistence of a winter (and El nino)-like zooplankton community that appear to have ramifications for food chain structure and subsequent energy flow up the food chain. Most of the changes appear to be chiefly related to local production because there have not been any observations of unusual fish or nekton species with tropical affinities in waters of the Pacific Northwest. It is noteworthy that the warm-water event of 2005 may have been initiated as early as October 2002 since both the Pacific Decadal Oscillation (PDO) and the Multivariate ENSO indices changed sign to positive at that time. When changes in sign of these large climate indicators persist for more than a few months, changes in ecosystem structure can be expected. Indeed, zooplankton species composition off Oregon has been dominated by warm-water copepods since late 2002,

and the abundance of euphausiid (krill) eggs declined starting in 2002; no eggs were detected in 2005 until late July, which is unusually late in the season. Juvenile salmon catches in pelagic-trawl surveys were low in both 2004 and 2005, indicating low marine survival. The 2004 catches were less than half the 1999-2003 averages, and 2005 catches were even lower than the previous low catch in 1998.

Hey-Jin Kim Mature Poster
Title Stratification changes and upwelling efficiency in Southern California Current
Authors: Hey-Jin Kim, Art Miller, Doug Neilson, and John McGowan Scripps Institution of Oceanography
Abstract: California current System (CCS) is highly variable and very productive. Many physical processes interact with various temporal and spatial scales, and they interact with the marine ecosystem. Long-term changes of the biological response to physical climate forcing are one of the main issues of interest, because the nonlinear ecosystem may not be linearly related to the persistent environmental disturbances (Hsieh et al., 2005). Roemmich and McGowan (1995) showed very unique observations of long-term physical-biological interaction in Southern California current and suggested that surface warming forced increased stratification, which capped the cold nutrient-rich upwelling cell, and consequently resulted in 70 % decrease in macrozooplankton biomass in the Southern California current. However, the linkage between stratification changes and zooplankton biomass is still not well understood. This study analyzes patterns of long-term stratification changes quantitatively in terms of mixed layer depth and thermocline depth with the in-situ dataset of 55 year CalCOFI (California Cooperative Oceanic Fisheries Investigations), and examines the upwelling efficiency and the primary production related to the stratification changes by in-situ data and modeling study.

Mike Kosro Remote Sensing?
Title TBD
Abstract: TBD

Raphael Kudela Remote Sensing
Title Detecting Iron From Space…Promise or Pipe Dream?
Abstract: TBD

Cathryn Lawrence Mature Poster
Title Optimal wind patterns for plankton productivity: a WEST model analysis
Authors: Cathryn A. Lawrence, UC Davis Hiroyuki Yokomizo, Kyushu University Louis W. Botsford, UC Davis Alan M. Hastings, UC Davis
Abstract: One of the central questions in WEST was, "How does plankton production respond to winds?" Previously, we showed results for the optimal case when winds are constant, using a simplified model containing the mechanisms thought to be important. Here we show response to variable winds by comparing simulated productivity to predictions made from volume upwelled, the type of upwelling index typically used.

Predictions on daily time scale are good and primarily due to common zeroes. Predictions are not as good on annual scales and correlations can be negative. We also address the question, “What is the optimal wind pattern?” as a step toward developing a modification of the upwelling index to use in assessing plankton productivity from winds. We will show how the results are related to best timing of wind and relaxation events.

Steve Lentz Mature Talk or Poster
Title Undertow - Something to worry about?
Authors: Steven J. Lentz, Melanie Fewings,Janet Fredericks, John Trowbridge - WHOI Peter Howd University of South Florida Kent Hathaway CHL Field Research Facility
Abstract: Surface gravity waves propagating shoreward force an onshore flow (Stokes drift) above the wave troughs and a compensating offshore flow below the wave troughs referred to as undertow. Current profile observations from a site in 13 m of water off Marthas Vineyard Massachusetts and seven sites in 5 - 13 m of water off North Carolina provide compelling evidence that the depth-averaged offshore flow (below the wave troughs) at these inner-shelf sites is primarily undertow. The observed offshore transports are correlated Predicted offshore transports estimated using linear wave theory and observed wave characteristics accounts for 50% or more of the observed offshore transports at each site. The theoretical estimates also reproduce the observed dependence of the offshore transport on wave height and water depth. During moderate to large waves and weak wind stresses, the flow profile in 13 m of water is curved with maximum offshore flow near the surface decreasing to near-zero flow at mid depth and below. The offshore flow is more sheared in summer than winter for the same wave characteristics, presumably due to the stronger stratification in summer. The observed undertow can be an effective mechanism for exchange between the beach/surfzone and the inner shelf.

Thomas C. Malone OOS
Title The Coastal Component of the U.S. Integrated Ocean Observing System
Authors: T.C. Malone, L. Dantzler, M. Hemsley, A. Clark and R. Cohen
Abstract: The Integrated Ocean Observing System (IOOS) is being designed and implemented to provide data and information needed to significantly improve the nation’s ability to achieve seven societal goals: (1) improve predictions of climate change and weather and their effects on coastal communities and the nation; (2) improve the safety and efficiency of maritime operations; (3) more effectively mitigate the effects of natural hazards; (5) improve national and homeland security; (6) reduce public health risks; (6) more effectively protect and restore healthy coastal ecosystems; and (7) enable the sustained use of ocean and coastal resources. Achieving these goals depends on the establishment of a robust network of operational observing activities that routinely, reliably, and continuously provides data and information on oceans and coasts, in forms and at rates specified by groups that use, depend on, manage, and study marine systems. The global ocean-climate component of the IOOS is in the early stages of implementation. The recently completed First IOOS Development Plan focuses on the coastal component of the IOOS and addresses many recommendations of the U.S. Commission on Ocean Policy, including those for establishing an IOOS with an emphasis on regional development, developing the capacity for ecosystem-based management, and

linking IOOS data and information to applications. Design and implementation plans for the coastal component of the IOOS are the subject of this presentation.

Dave Martin OOS
Title The Ocean Observatories Initiative (OOI): Opportunities and Challenges
Authors: Dave Martin
Abstract: The National Science Foundation's Ocean Observatories Initiative (OOI), is a proposed major effort to be funded under the auspices of the Foundation's Major Research Equipment and Facilities Construction (MREFC) account. The research-focused OOI and the societal goal/user-driven Integrated Ocean Observing System (IOOS) are two mutually synergistic and necessarily collaborative ventures that help to form a single unifying vision for ocean observing in this country. The OOI seeks to provide the capability to investigate oceanic processes (biological, chemical, geological, and physical) at the scales at which they occur by providing the necessary infrastructure, including high-bandwidth communications and power, to enable investigations across a broad range of temporal and spatial scales. In this regard, three primary components of the OOI are envisioned, specifically:

A Global-scale component focusing on moored buoy systems
A Regional-scale seafloor fiber optic cable system
A network of Coastal observatories

In all of these components, OOI Cyberinfrastructure is expected to allow users to remotely control their instruments, perform *in-situ* experiments, construct virtual observatories, and access data in near-real-time. The current status of the OOI initiative, including international activities, and prospective timelines for U.S. efforts will be examined.

Diane Masson General Poster
Title Co-variability of the Strait of Georgia and the northeast Pacific Ocean on climatic time scales
Authors: Diane Masson and Patrick F. Cummins Institute of Ocean Sciences Sidney BC
Abstract: A 35 year record of bimonthly vertical temperature profiles from the deep central Strait of Georgia is examined. Decomposition of the variability into empirical orthogonal modes shows that the dominant mode, accounting for over 70% of the variance, has its maximum amplitude at mid-depth in the water column. Amplitudes decrease towards the bottom, and more markedly towards the surface. The principal component (PC1), or time series, associated with this mode is dominated by long period fluctuations on interannual to decadal time scales. PC1 clearly shows the recent cool episode of 1999-2002 and the subsequent warming of 2003.

These results from the Strait of Georgia are compared with subsurface observations from Line P in the northeast Pacific. A close correspondence is found between the major warming/cooling episodes occurring offshore with those observed in the Strait. The main exception is the remarkably strong cold anomaly of 1979 which appears to have been

locally forced. Apart from this, the comparison indicates that on interannual to decadal time scales, conditions in the Strait co-vary with large scale northeast Pacific anomalies. It is suggested that the response to wind forcing over the ocean interior is an important mechanism driving this variability.

Erica McPhee-Shaw Mature Talk or Poster
Title Temporal variability of internal tides over the northern California continental slope: reassessing a multi-year record from the STRATAFORM project.
Authors: Erika McPhee-Shaw. Moss Landing Marine Laboratories/SJSU David Cacchione. Coastal and Marine Environments, Reno NV. Andrea Ogston. University of Washington School of Oceanography
Abstract: Although dissipation of internal tide energy is an important component of ocean mixing, there is inadequate understanding of the timing of energetic internal wave events. The strength of internal tides and bores on continental shelves has been observed to vary seasonally in response to changes in coastal ocean stratification. However relatively few studies have examined the temporal variability of the internal wave field over deeper continental slopes, particularly at seasonal and longer time scales. Continental slopes are important because interaction with topography (internal wave generation, reflection, and scattering) can alter the background Garrett-Munk spectrum to enhance energy at tidal frequencies, and at tidal harmonics and other frequencies. Energy at these frequencies can be transferred to higher vertical modes than are typically seen in the open ocean, and associated wave breaking and dissipation may erode and mix continental margin sediment. Seasonal variability in the angle of critical topography is hypothesized to be one factor modulating the near-bottom internal tide field over the northern California continental slope. Here we examine temporal variability of internal tides measured from a mooring at 450-m depth on the northern California continental margin during the STRATAFORM (STRATA FORmation on Margins) program (~1995 – 2000). Previous publications (Cacchione et al., 2002, McPhee-Shaw et al., 2004) discuss intense semidiurnal tides and critical reflection at this site, but with a three year long time series now available, we can better assess seasonal variability than was possible in earlier analyses of shorter portions of the record.

Satoshi Mitarai General Poster
Title A Numerical Study of Stochastic Larval Settlement in the California Current System
Authors: Mitarai, S., University of California, Santa Barbara, CA Siegel, D.A., University of California, Santa Barbara, CA Warner, R.R., University of California, Santa Barbara, CA Winters, K.B., Scripps Institute of Oceanography, La Jolla, CA
Abstract: Key to the predictive understanding of many nearshore marine ecosystems is the transport of larvae by ocean circulation processes. Many species release thousands to billions of larvae to develop in pelagic waters, but only a few lucky ones successfully settle to suitable habitat and recruit to adult life stages. Methodologies for predicting the larval dispersal are still primitive and simple diffusive analyses are still used for many important applications. In this study, we assess the scales of larval dispersal using idealized simulations of time-evolving, three-dimensional, coastal circulations in the California Current system with quasi-Lagrangian particles as models for planktonic

larvae. To account for larval behavior, we model both semi-Lagrangian particles that follow surface water parcels, but also larvae that actively alter their depths within the water column. The resulting trajectories are used to assess larval dispersal kernels (or probability densities of larval travel distance), spatio-temporal scales of larval settlement patterns and connectivity matrices that describe the source-to-destination relationships for larval dispersal for a given larval development time course. The present results indicate that, for many important cases, larval dispersal is far from a simple diffusive process and can be highly heterogeneous in space and intermittent in time. The stochastic nature of larval dispersal will create unavoidable uncertainty in recruitment complicating the management of nearshore ecosystems.

Stephanie Moore Extreme Events
Title Harmful Algal Blooms off the Oregon and Washington Coasts
Abstract: TBD

Jan Newton Extreme Event
Title Hypoxia in Hood Canal: status and contributing factors
Authors: Jan Newton, University of Washington, Applied Physics Laboratory Dan Hannafious, Hood Canal Salmon Enhancement Group Mark Warner, University of Washington, School of Oceanography Al Devol, University of Washington, School of Oceanography Matthew Alford, University of Washington, Applied Physics Laboratory Mitsuhiro Kawase, University of Washington, School of Oceanography
Abstract: Hood Canal, a fjord-like sub-basin of Puget Sound, Washington State, USA, is a long, deep, narrow, productive estuary with strong seawater density stratification. These are all conditions conducive to its slow circulation and seasonally low oxygen concentrations, based on observations dating back to the 1950's. However, in recent years, especially since the mid- 1990's, the frequency, duration, and spatial extent of the hypoxia has increased. Major biota kills occurred in both 2002 and 2003, though kills have been reported historically as well. Of concern, the inventory of dissolved oxygen in the deep waters of the southern portion of the canal, where the hypoxia is strongest, measured during the 2000's are among the lowest, and 2004 is currently the lowest, on record compared to data from the 1950's, 60's, and 90's. We present an update and analysis of the oxygen and other hydrographic data to date. Causes for this severe and seemingly deteriorating condition could be many and potentially include human-mediated loading of nitrogen or organics, changes in river, flow delivery that could affect circulation, changes in oceanic water properties, and local weather forcing. We present the evidence for some of these contributing factors. A modeling study will address the quantitative balance of these factors in driving the observed hypoxia.

Nikolay Nezlin Remote Sensing?
Title Stormwater runoff plumes observed by SeaWiFS radiometer in the Southern California Bight
Authors: Nikolay P. Nezlin (SCCWRP), Paul M. DiGiacomo (JPL), Eric D. Stein (SCCWRP), Drew Ackerman (SCCWRP)
Abstract: Understanding the factors that influence the incidence and dispersal patterns of freshwater runoff plumes in southern California is important for management of coastal

water quality. Significant river discharge is associated with episodic winter rainstorms, leading to turbid pollutant and pathogen-laden stormwater plumes that are clearly visible nearshore in the Southern California Bight. We analyzed 1.1-km spatial resolution sea-spectral reflectance data acquired in 1997–2003 by the Sea-viewing Wide Field-of-view Sensor (SeaWiFS), focusing on four regions with distinctive adjacent watershed properties: Ventura, Santa Monica Bay, San Pedro Shelf, and Orange County/San Diego. The area of each plume was detected by the backscattering characteristics of surface waters, i.e., normalized water-leaving radiation of green-yellow wavelength 555 nm (nLw555). Plume area size was correlated with the rainstorm magnitude, which was estimated from atmospheric precipitation averaged over the total area of the watersheds connected to the seashore. The time lag between rainstorm and maximum plume was one day in San Pedro Shelf and two days in other three regions. Assessing maximum correlation between precipitated rainwater and the plume size, we estimated the optimal nLw555 values best characterizing the plume boundaries in each of the four study regions. Another quantitative characteristic derived from maximum correlation between rainwater and plume size was the "coefficient of persistence", related to the speed of freshwater discharge and the time of plume water dissipation; it was also different in different watersheds. The primary factors regulating the relationship between rainstorm and plume were watershed land-use characteristics, size, and elevation.

Marlene Noble General Poster
Title Spatial variation of currents associated with internal bores off southern California
Authors: Marlene Noble, Kurt Rosenberger, Jingping Xu and Joe Meistrell
Abstract: The continental shelf off Palos Verdes CA is 15 km long and less than 3 km wide. The cross-shelf angle of the seabed is 1-3 degrees, roughly critical for internal tides. Since 2001, Los Angeles County Sanitation District has deployed moorings at 9 sites to collect current velocity and temperature profiles on this shelf. The mooring data show strong near-bed currents over the entire shelf that indicates the occurrence of internal bores. Near-bed current speeds often exceed 30 cm/s, strong enough to suspend fine sediments for several hours. During these events, currents in the middle of the water column are weaker, at least 15 cm/s lower than those measured near the bed. The characteristics of these internal events vary markedly along the shelf. The events are stronger and seen more often along the southeast section of the shelf than at locations in similar water depths just 5 km to the northwest. Bottom sediments are significantly coarser in the higher-energy environment, suggesting that the internal bores sweep fine sediments from this area of the seabed. The occurrence of the internal bore events is weakly associated with strong internal tides at the shelf break, but the energy in the internal tides does not vary significantly with distance along the shelf. Hence the spatial structure of the internal bores is not driven by variation in internal tidal forcing. The occurrence and structure of the bores may be more strongly associated with variation in shelf topography.

Jeff Paduan Round Table
Title COCMP discussion within Observing System Panel Session
Authors: Paduan, J.D., E.Terrill

Abstract: An overview of the Coastal Ocean Currents Monitoring Program (COCMP) funded by the State of California to create a state-wide surface current mapping network and surf zone prediction system will be discussed as part of the round-table discussion of major observing system programs.

Daniel Palacios Mature Talk or Poster

Title Temperature-nitrate relationships in the California Current: Old data for young models

Authors: Daniel M. Palacios1,2, Steven J. Bograd2, Franklin B. Schwing2, and Roy Mendelssohn2 1Joint Institute for Marine and Atmospheric Research, University of Hawaii, 1000 Pope Road, Marine Sciences Building, Room 312, Honolulu, HI 96822 2NOAA, Southwest Fisheries Science Center, Environmental Research Division, 1352 Lighthouse Avenue, Pacific Grove, CA 93950

Abstract: The World Ocean Database 2001 contains hydrographic data from a number of old programs and institutions, including CalCOFI, CTZ, MLML, HMS, UW, and OSU. We supplement these data with those of more recent programs, such as GLOBEC/LTOP and COOP/WEST, to obtain a record of subsurface (0-200 m) nitrate, temperature, and salinity in the California Current System (CCS; 30-47?N), spanning the period 1959-2004. An extract of this data set within 0.5 degrees from the coast yields ~ 35,478 observations. We use generalized additive models (GAMs) to develop a statistical model of nitrate based on temperature, salinity, latitude, and an annual cycle as explanatory variables. We apply this model to predict nitrate from a set of subsurface temperatures at various locations within the CCS spanning the period 1950-1993. We derive indicators that describe interannual variability in nitrate availability and potential primary production.

Brad Penta Remote Sensing

Title POSTER: Evaluation Of The NRL Near Real-Time Model Of The California Current Ecosystem Using Newly Developed Remote Sensing Techniques

Authors: B. Penta, J. K. Jolliff, I. Shulman, S. deRada, S. C. Anderson, Z. P. Lee, R. A. Arnone, and J.C. Kindle Naval Research Laboratory - Stennis Space Center

Abstract: The Naval Research Laboratory's (NRL) regional Navy Coastal Ocean Model for the California Current System (NCOM-CCS) is running in near real-time for the US West coast. The model couples a physical circulation model to a nine-component ecosystem model at 9 km resolution. Using remotely-sensed information, new techniques for the evaluation of the ecosystem model output are being developed.

The quasi-analytical algorithm (QAA) of Lee et al. (2002) is used to estimate the absorption coefficients of phytoplankton pigments (a?) from remote sensing reflectance (Rrs) measured by ocean color sensors. This calculated a? is a proxy for phytoplankton biomass. Near-surface phytoplankton contribute more to the remotely-sensed signal than deeper-dwelling ones. Therefore, in order to make the model output comparable to the satellite data, the satellite-equivalent sensor penetration depth of the model is calculated and the modeled phytoplankton are optically weighted over this depth. Spatial and temporal coherence between the observed and modeled phytoplankton fields are examined.

The phytoplankton in the ecosystem model is composed of two functional groups: diatoms and small phytoplankton. The chlorophyll-specific absorption coefficient (a*), obtained by the division of a? by total chlorophyll, provides a measure of the light utilization efficiency of phytoplankton. When compared to small phytoplankton, larger cells (diatoms) are less efficient at harvesting light on a per unit chlorophyll basis due to the "package effect"; therefore large diatoms may have lower a* values. We are testing new techniques to analyze apparent a* values obtained via remote sensing and thus determine the size fractionation and species composition of the bulk chlorophyll-a signal.

Laura Pederson Extreme Events

Title Extracting Advance Tsunami Information from SeaSonde HF Radar Echoes

Authors: **Barrick, D.[1], Lipa, B.[1], Ramp, S.[2], Pederson, L.[1]**

[1] CODAR Ocean Sensors, Mountain View, CA, U.S.A.

[2] Naval Postgraduate School, Monterey, CA, U.S.A.

Abstract: The SeaSonde is a type of coastal HF radar (called CODAR) used for surface current mapping and wave monitoring. Over 160 units are deployed, presently providing continuous, real-time coverage along large stretches of U.S. and Asian coasts. The question arose some time ago whether these CODARs could detect tsunamis and provide useful information in a timely fashion. Barrick [A Coastal Radar System for Tsunami Warning, *Remote Sensing of Environment, 8,* pp. 353-358,1979] showed that the tsunami wave's orbital velocity would provide a detectable signal near shore that depended on water depth and tsunami amplitude.

In light of the catastrophic Dec. 26, 2004 tsunami off Banda Aceh, Indonesia, we have re-examined and refined these calculations. During the 25 year interval after the above publication, CODAR system performance has improved and maximum range has increased. Range of surface current mapping alone, however, is not sufficient to guarantee detection of the tsunami against the background. Hence, we have developed the capability of assessing the performance against tsunamis for any part of the world coastlines, based on the local offshore bathymetry. We begin with simulations from the New Jersey SeaSonde network, where a hypothetical tsunami wave is superposed over surface currents mapped to 200 km.

We illustrate performance capability with two case studies based on parameters from the recent 2004 tsunami. One case focuses on Penang, Malaysia, where the water is shallow over an extended zone; the other is Chennai, India which has a steep depth roll-off out from shore. For the 50 cm tsunami amplitude reported in deep water (4000 m), a 54 cm/s orbital velocity is observable by the HF radar 96 minutes before the tsunami reaches the Penang coast. Contrast this with the deep-water situation at Chennai, where the same tsunami wave produces a detectable orbital velocity of 4.3 cm/s 23 minutes before coastal impact.

We have supported the simple linear wave theory of the above reference with hydrodynamic model calculations that include a continuously varying depth. These theories agree with each other and with energy conservation as long as the bottom slope is not too precipitous, so that the WKBJ approximation holds. For very steep shelves or

seamounts, we show that simple vertically-integrated models that we and others use break down. Currents seen by the radar above these features are less than those predicted by the simpler models, as reflection and refraction re-direct the incident energy.

In future scenarios, the recent disaster suggests a system where a watch begins with the detection of the causative seismic event. A numerical forecast refined by data from bottom pressure observations as the deep-water small amplitude wave passes overhead would be the basis for a refined warning passed along to potentially impacted coastal regions. As the wave approaches, but with fractions of an hour or longer before impact, we suggest that an operating coastal HF radar network would further refine the predictions, providing expected local conditions needed by authorities in order to direct and manage emergency operations.

Steve Pierce General Poster
Title Bioacoustical analysis of zooplankton distributions during mesoscale surveys in the Northern California Current System
Authors: Stephen D. Pierce, John A. Barth, William T. Peterson, and Timothy J. Cowles Oregon State University
Abstract: During spring and summer 2000, two mesoscale mapping cruises surveyed the northern California Current system from 41.9-44.6N and up to 150 km offshore, part of the U.S. Global Ocean Ecosystems Dynamics Northeast Pacific program. Concurrent with the physical and bio-optical measurements made from a towed undulating vehicle (SeaSoar) and shipboard acoustic Doppler current profiler (ADCP), a multi-frequency (38/120/200/420 kHz) towed bioacoustics instrument collected backscatter data. With an assumed randomly-oriented bent cylinder model, we use an inverse method to estimate zooplankton abundance in size classes from 3-24 mm. The inverse problem is solved using a linear programming technique, new to bioacoustics. This method is more resistant to noise and unknown sources of acoustic backscatter than the non-negative least squares method, as we verify with simulations and validation against net sampling.

Wind stress was upwelling-favorable during both the spring (30 May -2 June 2000) and summer (30 July - 4 August 2000) large-scale survey periods. In spring, the coastal upwelling jet and front largely follow bottom topographic contours, while in summer the upwelling jet was characterized by significant meanders offshore. Between spring and summer surveys, the 3-4 mm (adult copepod) zooplankton class increases by a factor of 2.6+/-0.4 in abundance, and the 11-24 mm (adult euphausiid) increases by a factor of 2.4+/-0.5. Adult euphausiids are noticeably absent inshore of the 70-m isobath during summer, while the 5-10 mm (juvenile euphausiid) class includes inshore patches. During both surveys, significant zooplankton patches were often found over bathymetric features such as Heceta Bank (44N). The suggestion that this major submarine bank is a zone of retention is consistent with flow-topography interactions previously reported, leading to recirculation around or retention of water on the bank. Another retention mechanism was noted during the summer survey, when the energetic upwelling jet exhibited large meanders offshore: significant euphausiid patches were associated with the weak velocity region offshore of the jet and inside a meander (43.5N).

In general, zooplankton as well as phytoplankton mesoscale patches are negatively correlated with flow speed. We also observed a normal diel cycle in all size classes, and in the adult euphausiid case we document nocturnal sinking and a semi-diel midday rise and fall. Many aspects of the diel migration cycle are also confirmed through analysis of ADCP vertical velocity. The effects of diel vertical migration in reducing or eliminating horizontal advection of both euphausiids and copepods are illustrated by analysis of horizontal ADCP currents at different depths.

Steve Piotrowicz OOS Talk
Title ARGO Observing system
Abstract:

Steve Ramp Mature Talk
Title A Comparison of the Currents and Water Mass Structure North and South of Cape Blanco
Authors: Steve Ramp, Naval Postgraduate School Barbara Hickey, Un. of Washington Fred Bahr, Naval Postgraduate School
Abstract: A fundamental premise of the GLOBEC Northeast Pacific Program was that different dynamical and ecological regimes north and south of the separation point for the coastal upwelling jet lead to varying degrees of retention, recruitment and year-class strength for salmon along the Oregon coast. The Long-Term Observation Program (LTOP) moorings were deployed with this hypothesis in mind, spanning the jet separation point which most commonly occurs near Cape Blanco (42° 48´N). Two moorings deployed at 43° 09.38´N 124° 34.14´W, 100 m depth; and 42° 26.44´N 124° 34.44´W, 72 m depth; were maintained continuously from November 2001 to November 2004 by the University of Washington and the Naval Postgraduate School respectively. In this paper, the currents, temperature, and salinity at the two moorings are compared in detail using plots, statistics, correlation analysis, and wavelet transforms. The two regimes are indeed dramatically different with longer residence times south of Cape Blanco. Future work will synthesize these results with the biological data collected by other GLOBEC investigators during the program.

Erich Rienecker General Poster
Title Studying the ecology of red tides and harmful algal blooms using synoptic mapping of the phytoplankton size distribution
Authors: Erich Rienecker, John Ryan, Roman Marin, Ryan John, Marguerite Blum, Francisco Chavez (MBARI)
Abstract: During a 5-week time-series study of phytoplankton ecology in Monterey Bay, California, intensive in situ measurements detailed development of two phytoplankton blooms: 1) a bloom of pennate diatoms of the genus Pseudo-nitzschia, some of which are harmful algal bloom species, and 2) a red tide bloom dominated by dinoflagellates of the genus Ceratium. Combining synoptic mapping of the phytoplankton size distribution (PSD) from Sequoia Scientific LISST-100 deployed on a towed undulating vehicle with multidisciplinary mapping from remote and in situ sensing, we describe ecological aspects of these blooms. During the Pseudo-nitzschia bloom, cell concentrations measured from water samples ranged between 0.7 and 1.7 x 107 cells/liter. PSD

measured with the LISST in the lab for concentrations of this magnitude closely matched those measured in situ with regard to spectral shape and the magnitude of concentration estimates. Observations showed that the development of the bloom was strongly influenced by an intrusion of low-salinity offshore waters. The Ceratiam bloom closely followed another low-salinity flushing event and resulted in a highly patchy red tide throughout the bay. Lab testing showed that the LISST accurately describes the PSD of dinoflagellates in culture. The in situ LISST data from this event, together with satellite observations illustrate the spread and intensification of this red tide.

Craig Risien Remote Sensing
Title A HIGH RESOLUTION SCATTEROMETER-BASED CLIMATOLOGY OF WIND-STRESS AND WIND-STRESS CURL OVER THE CALIFORNIA CURRENT, 1999-2005
Authors: C.M. Risien, D.B. Chelton & M.H. Freilich College of Oceanic and Atmospheric Sciences, Oregon State University, Corvallis, Oregon, USA
Abstract: A 25-km resolution scatterometer-based climatology of wind-stress and wind-stress curl is presented over the California current for the period 01 August 1999 – 31 July 2005. Now in its seventh year of operation, the SeaWinds scatterometer, launched on 19 June 1999 onboard the QuikSCAT satellite, has provided the scientific community with an unprecedented wealth of global ocean wind measurements. SeaWinds is an active microwave radar that measures electromagnetic backscatter from the wind-roughened ocean surface, inferring 10-m vector winds with an accuracy equivalent to well-calibrated buoy observations. Global QuikSCAT wind fields, available in near all-weather conditions, have spatial and temporal resolutions and coverage that far exceed those of in situ observations. QuikSCAT wind observations therefore provide an exceptional opportunity for the spatial and temporal study of fine scale structures of nearshore curl features that force the upwelling and downwelling of the upper ocean, processes which are known to significantly impact the dynamics, thermodynamics and biology of the coastal ocean. Previously these fine scale structures were only coarsely resolved by authors such as Bakun and Nelson, who used historical wind reports based on a 1° resolution to define characteristic seasonal distributions of wind-stress curl over the four major eastern boundary current regions of the World Ocean. In addition to the 25-km results, preliminary results from a newly processed 12.5-km resolution QuikSCAT dataset will be presented.

Kurt Rosenberger General Poster
Title TBD
Abstract: TBD

Leslie Rosenfeld OOS Poster
Title A Real-time Online Wind Product for Monterey Bay
Authors: L. Rosenfeld, Naval Postgraduate School, Monterey CA Y. Chao, Jet Propulsion Laboratory, Pasadena, CA T. Anderson, Naval Postgraduate School, Monterey CA P. Li, Jet Propulsion Laboratory, Pasadena, CA
Abstract: As part of the Center for Integrated Marine Technologies pilot ocean observing system project, NPS and JPL have developed an online near real-time surface

wind product for Monterey Bay. This product, aimed at the marine recreational user, shows surface winds from a mesoscale atmosphere model (COAMPSTM with 3 km resolution), courtesy of Jim Doyle at NRL Monterey, together with winds measured within 5 m of the surface from three MBARI buoys and one NDBC buoy, and within 10 m of the surface at seven coastal stations.

A graphic showing model and measured wind vectors overlain on model wind speed contours is updated hourly, and an animation shows the surface winds during the past 48 hours and the forecast winds for the upcoming 24 hours. The most recent observed wind speed and direction, along with station name and location, pops up in a text box when the user mouses over the station location on the graphic. Time series plots comparing modeled with observed wind speed and direction for the past 48 hours, as well as forecast winds for the upcoming 48 hours are pulled up by clicking on any of measurement sites. The time series data are also presented as text listings. The same information, minus the measured winds, is also available for a subset of other model grid points.

Background information about the observations, model, and the local meteorology for this area are also provided.

Moninya Roughan Mature Talk or Poster
Title The evolution of wind driven upwelling along the Northern Californian Shelf
Authors: Moninya Roughan, Scripps Institution of Oceanography, University of California San Diego., N Garfield, Jeff Dorman, Dwight Peterson San Francisco State University, John L. Largier, Bodega Marine Laboratory, University of California, Davis.
Abstract: We examine the temporal and spatial evolution of wind driven upwelling over three consecutive upwelling seasons on the northern Californian Shelf. The field work was conducted as a major component of the WEST (Wind Events & Shelf Transport) project, (a 5-year NSF/CoOP-funded study of the role of wind-driven transport in shelf productivity) off Bodega Bay (northern California) from 2000-2003. Data collected include mooring, shipboard, HF radar and satellite data on wind, current, hydrography, nutrients, primary production, phytoplankton, and zooplankton.

Here we focus on the shipboard data acquired during the three spring-summer cruises in May-June 2000-2003. Specifically we combine shipboard velocity profiles (ADCP) and water properties from hydrographic surveys to examine the temporal evolution of upwelling at 2 locations across the shelf. We also investigate the spatial (both alongshore and across shore) evolution of upwelling. The three seasons examined present different conditions dictated by the strength and persistence of the wind forcing. In the center of our study region (D-line), there is a clear delineation between the mid-shelf (90m isobath) and offshore (130m isobath). Upstream of this line the upwelling zone narrows, and is trapped closer to the coast. Downstream of the central line the upwelling zone extends offshore, driven by changes in alongshore topography.

John Ryan Remote Sensing
Title Multi-scale studies of physical-biological coupling in the coastal ocean

Authors: John Ryan, Erich Rienecker, Andrew Fischer, Patrick McEnaney, Francisco Chavez (MBARI) and Raphael Kudela (UCSC)
Abstract: Physical-biological (P-B) interactions in coastal waters span a wide range of spatial and temporal scales. From remote sensing we can quantify variation in physical and biological properties of the mixed layer. From in situ observations we can sea-truth remote sensing approaches, expand the measurement spectrum, and delve into water column structure that is central to understanding P-B coupling. Advancement of time-series observations from remote and in situ sensing is opening exploration of diverse aspects of P-B interactions. Applying recent time-series, this talk will illustrate P-B interactions of phytoplankton and zooplankton in coastal California waters, on time scales ranging from decades to hours and spatial scales ranging from basin-scale to meters. The focus will be on the ecological insights as well as the combination of multi-scale observational resources that make possible these insights.

Kipp Shearman Mature Talk
Title The Evolution of Mesoscale Features in the California Current: Observations from the EBC/ARI
Author Kipp Shearman
Abstract:

Curt Storlazzi Extreme Event
Title Sou'westers - Why winter storms during El Nino events cause heavy coastal erosion and storm damage along central California
Author: Curt Storlazzi US Geological Survey
Abstract: Significant sea cliff erosion and storm damage occurred along the central coast of California during the 1982-83 and 1997-98 El Nino winters, generating interest in understanding why these storms appeared to be more destructive than storms during La Nina winters. The deployment of robust oceanographic deepwater buoys by NOAA in the 1980s provides large quantities of high-resolution hourly data such as wave height, wave period, wind speed, wind direction and sea level barometric pressure. These data sets are now long enough in duration to compute statistically significant probability estimates of the behavior of the measured parameters. These data show that during El Nino winter months, sustained wave heights are greater and the waves and winds are more frequently out of the southwest than during La Nina winter months. The largest, most intense winter storms during El Nino events generally strike the coastline later in the winter, when beaches are already denuded of much of their sediment by earlier storms. Conversely, during La Nina events the strongest storms and largest waves strike earlier in the winter when the beaches are generally larger and can therefore better buffer the coastal cliffs and infrastructure. El Nino winter storms, which we term "Sou'westers", have the combination of timing, magnitude and direction that cause disproportionately greater beach erosion and storm damage to infrastructure along the coastline of central California than the storms during La Nina winters.

Ted Strub (Roberto Vengas) Remote Sensing Poster

Title Satellite-Derived Climatology and Interannual Variability In Surface Ocean Fields Along the Pacific Northwest
Author:Roberto Venegas and Ted Strub COAS/OSU
Abstract: Satellite-derived data are used to examine the 2-D structure of the temporal means, seasonal and non-seasonal variability for four physical and biological parameters off Oregon and Washington (~41°-49°N). Six years of data (1998-2003) are available for chlorophyll pigment concentrations (CHL), sea surface temperature (SST) and sea surface height (SSH); four years of data (2000-2003) are available for surface wind stress (TAU). Strong onshore-offshore and alongshore variability occurs in the temporal mean and seasonal climatology of CHL, SST and SSH.

Several different latitudinal regions are identified in this study: (1) the region off Washington (north of the Columbia River Plume); (2) the narrow shelf region near 45ºN, between the Columbia River and Heceta Bank (the site of the 1970's CUE studies); (3) the region over the Heceta Bank (44.4 ºN); (4) the region just north of Cape Blanco (43.4ºN); and (5) the region just south of Cape Blanco (42.3ºN). The Columbia River Plume, itself, can be considered a sixth "region" or environment.

Mean 2-D spatial fields are shown for the long-term temporal mean, the mean monthly seasonal cycles from harmonic fits, EOF's of the non-seasonal anomalies and time series from selected locations in each identified region. Seasonal cycles are removed to look at the interannual variability during this period for the 2-D maps and point locations.

Eric Terrill OOS talk or Poster
Title TBD
Abstract: TBD

Andrew Thomas Remote Sensing
Title Moving Towards the Coast
Authors: Andrew Thomas, University of Maine
Abstract: Data streams from both the MODIS and the Indian OCM satellites offer the ability to make ocean measurements in the visible wavelengths at spatial resolutions not previously possible with oceanographic satellites (250-500m). These data make it feasible to work much closer to the coast, in smaller bays and estuaries than previously possible and on spatial features not previously resolvable. As with all instruments and new data sets there are biases, unknowns and limitations. The purpose of this short presentation is to make the community aware of these data streams, with the thought that often even relative space patterns in remote sensing data offer significant insight into important processes.

Xiaochun (Adam) Wang General Poster
Title Tidal Simulation using ROMS
Authors: Xiaochun Wang, Changming Dong, Yi Chao, Zhijin Li, James McWilliams
Abstract: PDF went to Chair

Jingping Xu Extreme Event

Title Buried in Sands – Revisiting the February 2004 Storm in Southern California

Authors: Jingping Xu1, Jonathan Warrick1, Marlene Noble2

1 US Geological Survey, Pacific Science Center, Santa Cruz, CA 95060

2 US Geological Survey, Coastal and Marine Geology, Menlo Park, CA 94025

Abstract: The winter storm on 26-27 February 2004 wreaked havoc in Southern California, but provided an ideal opportunity to study the response of coastal sediment to a combination of tremendous river discharge and extreme wave activities. Stream flow in Santa Clara River reached 700 m3/s (the maximum of the year and comparable to a 3-5 year recurrence interval flood) and the NDBC buoy directly offshore the river mouth showed significant waves of 5 m at 17 s, which has a recurrence interval of approximately 10 years. Consequently, all four instrumented bottom platforms that were deployed along the 10 m contour around the toe of the subaqueous river delta were buried by as much as 1 m of sand during the storm and flood. Surprisingly, none of these four platforms were moved horizontally, despite storm waves of such high magnitude that a moored surface buoy and its 1000-kg anchor were washed onto the beach (a distance of nearly 1000 m). In this presentation we attempt to answer the following question: was the burial of our instruments due to (a) river sediment deposited during the flood, (b) seabed liquefaction caused by wave-induced cyclic stress, (c) burial by movement of the outer portion of the nearshore bar, or (d) a combination of these? The history of the burial is rebuilt using the hydrodynamic data and photographic records collected by the platforms. The properties of sediment cores taken in the region soon after the storm/flood event are used to determine the far-reaching impact of the storm/flood sediments.